

REMARKS

Favorable reconsideration and allowance are respectfully requested for Claims 1-11 in view of the foregoing amendments and the following remarks.

The foregoing amendments and the following remarks are directed towards the Patent Business Goals to expedite prosecution. Clarification of certain subject matter has been addressed.

Responsive to the election requirement, the election of species A is confirmed.

Responsive to the objections to the disclosure, by way of the foregoing amendments, the objections are obviated. Regarding the "push-start" phrase, this phrase refers to simply starting the vehicle by pushing it. Regarding lines 13-15 of sheet 14, the disclosure relates to two distinct ways. The specification has been thoroughly reviewed for grammatical errors and has been appropriately corrected. Accordingly, withdrawal of the objections is respectfully requested.

Regarding the objection to the Information Disclosure Statement, the Japanese Patent Document referred to on pages 1 and 2 was submitted with the Information Disclosure Statement on September 1, 2000. Provided herewith is a copy of the Information Disclosure Statement and a copy of the listed reference. Applicant respectfully requests that the Examiner consider this reference and note as such on the original Information Disclosure Statement.

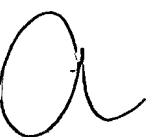
Responsive to the drawing objections, by way of the foregoing amendments, the objections are obviated. Submitted herewith is a request for approval of drawing corrections for Figures 7, 8, 9 and 11. No new matter has

been entered. Accordingly, withdrawal of the objections is respectfully requested.

Responsive to the claim objections, by way of the foregoing amendments, the objections are obviated. A gear change ratio relates to a difference between the torque of an input shaft and the torque of an output shaft or the number of revolutions of an input shaft to the number of an output shaft. Accordingly, withdrawal of the objections are respectfully requested.

Responsive to the rejections under 35 U.S.C. §112, first paragraph, by way of the foregoing amendments, the rejections are obviated. Regarding the Examiner's interpretation of Claim 3, the interpretation is seen as essentially correct. Accordingly, withdrawal of the rejections is respectfully requested.

Claims 1, 2, 5 and 8 were rejected under 35 U.S.C. §102(b) as anticipated by Tabata et al. These rejections are respectfully traversed. Tabata et al. do not disclose or suggest, among other features, a clutch provided on an input shaft or an output shaft of a gear change apparatus in order to change a torque transmission course, and by which a gear change operation is carried out to adjust a transmission torque between said input shaft and said output shaft. Tabata et al. show a conventional automatic transmission with a friction clutch and a planetary gear device. The drive system of Tabata et al. includes a number of planetary gear mechanisms, including a single-pinion-type planetary gear 16, an overdrive planetary gear 20 as an auxiliary transmission, a gear train 22 of three planetary gear sets which are all simply connected to construct a primary transmission, friction clutches, brakes, and one-way clutches. These all result in high production costs. The clutches in Tabata et al. do not provide the change of torque transmission course by which clutch a gear change operation is carried out to adjust the transmission torque between said input



shaft and said output shaft. The clutches in Tabata et al. do not change a torque transmission course and do not provide a gear change operation to adjust a transmission torque. Thus, it is respectfully submitted that the claimed invention is not anticipated by Tabata et al., as noted above. Accordingly, withdrawal of the rejection is respectfully requested.

Claims 3, 4 and 7 were rejected under 35 U.S.C. §102(b) as anticipated by Kriegler et al. These rejections are respectfully traversed. Kriegler et al. do not disclose or suggest, among other features, a rotation of an output shaft with an electric rotary machine is reduced and transmitted to an engine side input shaft of a gear change apparatus, wherein a first gear is mounted on the output shaft of the electric rotary machine, and a second gear is mounted on the input shaft of the gear change apparatus, each of the output shaft of the electric rotary machine and the input shaft of the gear change apparatus being provided with a respective clutch. Kriegler et al. show the rotary machines fixed to shafts. A number of clutches are needed in order to change a torque transmission course, and a planetary gear train is needed in order to realize the disclosed power transmission apparatus. The rotary machine shaft A3 is not provided with a clutch. Thus, it is respectfully submitted that the claimed invention is not anticipated by Kriegler et al., as noted above. Accordingly, withdrawal of the rejection is respectfully requested.

Regarding Claim 4, Kriegler et al. do not disclose or suggest, among other features, gears respectively mounted on an input shaft of the gear change apparatus for transmitting the power of the output shaft in said engine and the output shaft in said electric rotary machine directly engage with each other, the input shaft of the gear change apparatus and the output shaft of the electric rotary machine having respective clutches. In Kriegler et al., the output shaft of



engine A2 merely enters the planetary gear apparatus P. Likewise, the input shaft for the planetary gear 1 does not have a separate gear which meshes with any gear on the shaft of engine A2. The Examiner suggested that the planetary gear train anticipates these limitations. However, the construction of the planetary gear train does not provide that gears respectively mounted on an input shaft of the gear change apparatus and the output shaft of the electric rotary machine directly engage with each other. Thus, it is respectfully submitted that the claimed invention is not anticipated by Kriegler, et al., as noted above. Accordingly, withdrawal of the rejection is respectfully requested.

Regarding the gear change apparatus, the term "gear change apparatus" has been used to indicate a transmission. This term was used in order to avoid confusion between other terms, such a power transmission apparatus and transmission. For the above-noted reasons, it is respectfully submitted that neither Tabata et al. nor Kriegler et al. anticipate the claimed invention.

Claim 6 was rejected under 35 U.S.C. §103(a) as unpatentable over Kriegler et al. in view of Tabata et al. The rejection is respectfully traversed. Since Claim 6 depends from Claim 3, Claim 6 is also patentably distinguishable over the cited references for the above-noted reasons. Accordingly, withdrawal of the rejection is respectfully requested.

To further define the protection to which Applicant is entitled, new Claims 9-11 are submitted herewith. New Claims 9-11 relate to a power transmission apparatus. Support for these claims is found, *inter alia*, on pages 9-12.

It is respectfully submitted that the newly added dependent Claims 9-11 are patentably distinguishable over the cited references for the reasons as set forth above in relation to the response to the rejection of Claim 1, in addition to



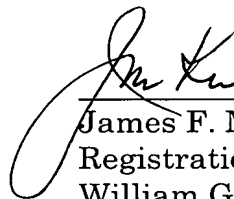
the limitations contained therein and the advantages achieved by the claimed invention.

In view of the foregoing amendments and remarks, the application is respectfully submitted to be in condition for allowance, and prompt favorable action thereon is earnestly solicited.

If there are any questions regarding this amendment or the application in general, a telephone call to the undersigned would be appreciated since this should expedite the prosecution of the application for all concerned.

If necessary to effect a timely response, this paper should be considered as a petition for an Extension of Time sufficient to effect a timely response, and please charge any deficiency in fees or credit any overpayments to Deposit Account No. 05-1323 (Docket #381AS/49210).

Respectfully submitted,



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MARKED-UP VERSION OF AMENDMENTS

IN THE SPECIFICATION

Please amend the specification as follows:

Please delete the first full paragraph on page 1 and insert the following paragraph:

The present invention relates to a structure of a power train system comprising an engine, and electric rotary machine (hereinafter, one primarily used for driving is called [as] an electric motor, one primarily used for generating power and starting an engine is called [as] a power generator and one used for driving and generating power with generally the same frequency [to] of each [other] is called [as] a motor generator) and a gear change mechanism, and more particularly to a power transmission apparatus for improving a transmission efficiency of a power train system.

Please delete the second full paragraph on page 1 and insert the following paragraph:

In view [of a problem] of global environment problems, it becomes important to establish a hybrid control system for motor vehicles, in which a great reduction of specific fuel consumption can be expected.

Please delete the paragraph starting on page 1 and ending on page 2 and insert the following paragraph:

In JP-A-10-217779, there is disclosed an integrated hybrid power transmission apparatus constituted by a single electric rotary machine, a speed change gear mechanism and a clutch mechanism. The apparatus disclosed in

the publication is so constituted that the gear change mechanism, having the electric rotary machine and the clutch mechanism, is integrally contained in a housing of the power transmission apparatus to make the power train system compact and light in weight. Further, by always connecting an input shaft of the gear change mechanism with the electric rotary machine, it is possible to [take] provide a driving manner so-called “[a] series hybrid system” in which an engine drives only the electric rotary machine to generate a power by a part of which other electric rotary machines are driven to run a vehicle. The engine and the electric rotary machine are totally controlled so as to satisfy a feeling of speed acceleration and deceleration desired by a driver and operate the engine and the electric rotary machine in a high efficiency zone.

Please delete the second full paragraph on page 2 and insert the following paragraph:

First, in order to reduce a torque shock during changing a gear change ratio, for example, from a first speed to a second speed or from a second speed to a third speed, it is necessary to arrange the electric rotary machine [in] at a drive wheel side to the gear change mechanism. On the contrary, in order to generate power by the engine drive force in the series hybrid manner, it is necessary to arrange the electric rotary machine in the engine side to the gear change mechanism. Accordingly, in order to prevent the gear change shock and also improve the gear change performance, at least two or more electric rotary machines are required, resulting in a problem that the drive system becomes a large size.

Please delete the paragraph starting on page 3 and ending on page 4 and insert the following paragraph:



With respect to the first problem, it is effective to dispose a mechanism of mechanically reducing a gear change shock in place of employing an electric drive force such as an electric rotary machine for reducing the gear change shock. Accordingly, the invention is of a power transmission apparatus of motor vehicles, which has an engine, a gear change apparatus arranged between the engine and a vehicle drive shaft, an electric rotary machine connected to an output shaft of the engine and the vehicle drive shaft via the gear change apparatus, and a clutch arranged between an input shaft and an output shaft of the gear change apparatus and regulating a transmission torque between the input and output shafts. [According to] By way of the clutch, it is possible to reduce the gear change shock generated during the gear change operation without arranging the electric rotary machine in the drive wheel side of the gear change apparatus.

Please delete the first full paragraph on page 4 and insert the following paragraph:

Preferably, the power transmission apparatus of motor vehicles comprises the clutch mounted on a gear of [a] minimum gear change ratio in the gear change apparatus. By mounting the clutch on the gear of [the] minimum gear change ratio (i.e. the high speed side gear), it is possible to meet any change of rotation speed before and after the gear change operation.

Please delete the paragraph starting on page 4 and ending on page 5 and insert the following paragraph:

With respect to the second problem the following technique will be possible. That is, in the hybrid vehicle, in order to improve the specific fuel consumption of the engine, there may be a case of stopping the engine when



stopping the vehicle and using the electric rotary machine for starting the engine at every time of starting the vehicle. In this case, in view of [an] electric efficiency, it is effective to reduce and transmit the rotation of the electric rotary machine to the engine shaft via the gear change apparatus in place of directly transmitting the rotation to the engine shaft. Thus, according to the invention, there is provided a power transmission apparatus of motor vehicles having an engine, a gear change apparatus arranged between the engine and a vehicle drive shaft, and an electric rotary machine connected to an output shaft of the engine and the vehicle drive shaft via the gear change apparatus, wherein a rotation of an output shaft of the electric rotary machine is reduced and transmitted to an engine side input shaft of the gear change apparatus.

Please delete the paragraph starting on page 5 and ending on page 6 and insert the following paragraph:

Further, in the case of driving the electric rotary machine by [an] engine power to generate electric power, it is effective to restrict the number of transmission mechanisms for transmitting the engine power to the electric rotary machine (e.g. the number of gears) to be small. Thus, according to the invention, there is provided a power transmission apparatus of motor vehicles having an engine, a gear change apparatus arranged between the engine and a vehicle drive shaft, and an electric rotary machine connected to an output shaft of the engine and the vehicle drive shaft via the gear change apparatus, wherein the output shafts of the engine and the electric rotary machine are provided separately, and gears respectively mounted on [the] both shafts for transmitting the power of [the] both shafts directly [engage] engaged with one another. By the direct engagement of the gears without interposing another gear



therebetween, it is possible to restrain a reduction of the efficiency of power transmission.

Please delete the first full paragraph on page 8, under the caption DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS OF THE PRESENT INVENTION, and insert the following paragraph:

Fig. 1 is a schematic view showing a whole drive system of motor vehicles according to a first embodiment of the invention. Reference [numeral] numerals 1 and 1101 [denotes] denote an engine and 11 and 1111 a motor generator which outputs a kinetic energy by an electric energy provided from a battery 13 over line 12 and which converts an applied kinetic energy into an electric energy to store into the battery 13. Reference numerals 21 and 1121 denote a wheel and 23, 923 and 1123 a wheel axle connected to a final gear 20, 920 and 1120.

Please delete the second full paragraph on page 8 and replace it with the following paragraph:

Reference [numeral] numerals 5, 805, 905 and 1105 [denotes] denote a gear generally called [as] a high speed drive gear, and 15, 815, 915 and 1115 a gear generally called [as] a high speed driven gear which engages with the high speed drive gear 5. The high speed drive gear 5 is fixed on a transmission input shaft 4, 1104.

Please delete the third full paragraph on page 8 and insert the following paragraph:

Reference [numeral] numerals 6, 806, 906 and 1106 [denotes] denote a gear generally called [as] a low speed drive gear, and 16, 816, 916 and 1116 a gear generally called [as] a low speed driven gear which engages with the low

speed drive gear 6. The low speed drive gear 6 is fixed on the transmission input shaft 4.

Please delete the paragraph starting on page 8 and ending on page 9 and insert the following paragraph:

Reference [numeral] numerals 7, 807, 907 and 1107 [denotes] denote a gear generally called [as] a middle speed drive gear which is fixed on the transmission input shaft [5] 4. Reference numerals 18, 818, 918, and 1118 denote a gear generally called [as] a middle speed driven gear, and 8, 1108 a motor generator driven gear. The middle speed driven gear 18 and the motor generator driven gear 8 engage with the middle speed drive gear 7, respectively. The relationship between the middle speed drive gear 7 and the motor generator driven gear 8 is set so as to have a gear ratio of transmitting a torque from the motor generator output shaft 10, 1110 to the transmission input shaft 4 with a reduced speed.

Please delete the first full paragraph on page 9 and insert the following paragraph:

Reference [numeral] numerals 9, 1109 [denotes] denote a motor generator dog clutch which has a function of engaging or disengaging the motor generator output shaft 10 with or from the motor generator driven gear 8. Reference numerals 17, 817, 917 and 1117 denote a gear change dog clutch. The gear change dog clutch 17 has a function of engaging or disengaging the transmission output shaft 19, 1119 with or from the low speed driven gear 16 or the middle speed driven gear 18.

Please delete the paragraph starting on page 9 and ending on page 10 and insert the following paragraph:

Reference [numeral] numerals 3, 903 and 1103 [denotes] denote a start clutch. It may be a so-called dry type in which a clutch disc mounted to the transmission input shaft 4 is pinched between a flywheel and a pressure plate to transmit a torque, and which may have a mechanism for performing an "ON/OFF" operation [is] of such a type that an operation force of a clutch pedal (not shown) is transmitted by a hydraulic actuator or the like. The start clutch 3 may be also [those] conventionally known, such as a wet type multi-plate clutch, an electromagnetic clutch and so on.

Please delete the first full paragraph on page 10 and insert the following paragraph:

Reference numerals 14, 814, 914 and 1114 denote a high speed multi-plate clutch which has a function of engaging and disengaging with [and from] the high speed driven gear 15 in a torque transmission mechanism 200 under an operation of a hydraulic actuator 24. Here, when the high speed multi-plate clutch 14 is gradually pressed by the hydraulic actuator 24, the torque of the transmission input shaft 4 is gradually transmitted to the transmission output shaft 19. A rotational speed of the transmission output shaft 19 can be controlled with relation to a load (a road status, a weight of vehicle body, etc.) by controlling a force for pressing the high speed multi-plate clutch 14 by means of the hydraulic actuator 24. In this case, a torque of the engine 1 is transmitted along a transmission course from the engine output shaft 2, 1102 to the transmission output shaft 19 successively through the start clutch 3, the transmission input shaft 4, the high speed drive gear 5, the high speed multi-plate clutch 14 and the high speed driven gear 15 (see Fig. 3).

Please delete the paragraph starting on page 13 and ending on page 14 and insert the following paragraph:



First, a description will be given of a control method in the stop mode. At a time of idling power generation (No. 1 in Table 1), the start clutch 3 is set to "ON", the high speed multi-plate clutch 14 is set to "OFF", the gear change dog clutch 17 is set to the N (neutral) position, and the motor generator dog clutch 9 is set to "ON". Accordingly, the torque from the engine 1 is transmitted to the motor generator 11 via the middle speed drive gear 7 and the motor generator driven gear 8, and it is possible to generate power while idling the engine 1 in a state that the vehicle stops. Further, in order to realize a smooth start from this state, it is necessary to start the vehicle while slipping the high speed multi-plate clutch 14. After starting, the high speed multi-plate clutch 14 is quickly disengaged, the transmission input shaft 4 and the transmission output shaft 19 are synchronously rotated by using the motor generator 11, an electronically controlled throttle 22, 1122 and the like, and the gear change dog clutch 17 is set to the 1st position. At this time, in [the] case that the gear change ratio of a gear stage having the multi-plate clutch arranged is small, there is a risk that the engine stops without starting. In this case, the engine is prevented from stopping at a time of starting by increasing the torque of the motor generator 11. Further, as another starting method, there is a method of first setting the start clutch 3 to "OFF", thereafter controlling the motor generator 11 so as to synchronously rotate the transmission input shaft 4 and the transmission output shaft 19, engaging the gear change dog clutch 17 with the 1st position, and starting to the torque of the engine 1 while slipping the start clutch 3, as conventionally known, or starting by the motor generator 11.

Please delete the paragraph starting on page 14 and ending on page 15 and insert the following paragraph:

Next, a description will be given of a control method at a time of idling stop (No. 2). The idling stop can be performed by setting the start clutch to "OFF" from the state of the idling power generation (No. 1) and stopping a fuel supply to the engine 1. At this time, it is necessary to set the gear change dog clutch 17 to the 1st position for realizing a smooth start from the idling stop. When starting, it is possible to employ a method of starting according to the torque of the motor generator 11 and a method of starting according to the torque of the motor generator 11 and push-starting the engine 1. In the case of push-starting the engine 1, it is necessary to control the rotational speed of the engine 1 within a range capable of starting while slipping the start clutch 3. Further, in the case of push-start, it is significantly effective to utilize an engine with electromagnetic drive type intake and exhaust valves. In the conventional type of engine in which the intake and exhaust valves are opened and closed by rotating a cam shaft, there is a cylinder at which the intake and exhaust valves are closed when the engine stops and this generates a great load, so that it is necessary that the motor generator 11 [generates] generate a great torque when push-starting. On the contrary, in the engine with the electromagnetic drive type intake and exhaust valves, it is possible to open the valves in all the cylinders when the engine stops and the load is reduced, so that the push-start can be easily performed, it is not necessary that the motor generator 11 [outputs] output a great torque, whereby it is possible to make the motor generator 11 compact. Further the structure may be made [such as] to start by the torque of the motor generator 11 according to a conventionally known starter motor (a dotted line 300 in Fig. 1) disposed in the engine side and start engine 1 by the starter motor so as to gradually engage the start clutch and add the torque of the engine 1, thereby running.



Please delete the paragraph starting on page 15 and ending on page 17 and insert the following paragraph:

Next, a description will be given of a [travel] functioning by the motor generator 11. When reversing (No. 3), the start clutch 3 is set to "OFF", the motor generator dog clutch 9 is set to "ON", and any one of the low speed driven gear 16, the middle speed driven gear 18 and the high speed driven gear 15 is selected so as to rotate the motor generator 11 in a negative direction (a forward direction of the vehicle is set to a positive direction and a backward direction is set to a negative direction), thereby running. It has been known that a great drive torque is required when reversing, the gear change dog clutch 17 may be set to the 1st position and the high speed multi-plate clutch 14 may be set to "OFF". Further, at a time of backward moving, the vehicle may be backwardly moved by engaging with a reverse gear (not shown) and transmitting the torque of the engine 1 to a wheel 21 while slipping the start clutch 3 as conventionally known. At a time of low vehicle speed (No. 4), the start clutch 3 is set to "OFF", the gear change dog clutch 17 is set to the 1st position, the motor generator dog clutch 9 is set to "ON", the high speed multi-plate clutch 14 is set to "OFF", and the motor generator 11 is positively rotated, thereby running the vehicle. In the same manner, at a time of middle vehicle speed (No. 5), the start clutch 3 is set to "OFF", the gear change dog clutch 17 is set to the 2nd position, the motor generator dog clutch 9 is set to "ON", and the high speed multi-plate clutch 14 is set to "OFF". Further, at a time of high vehicle speed (No. 6), the start clutch 3 is set to "OFF", the gear change dog clutch 17 is set to the N (neutral) position, the motor generator dog clutch 9 is set to "ON", and the high speed multi-plate clutch 14 is set to "ON". Further, in the drive modes Nos. 3 to 6 mentioned above, since the motor generator 11 is directly connected to the transmission output shaft 19, the energy can be regenerated at a time of reducing the speed.



Further, in the drive modes Nos. 4 to 6 mentioned above, it is possible to control the start clutch 3 so as to push-start the engine 1. Further, as mentioned above, it is possible to start the engine 1 by the starter motor and control the start clutch 3, thereby running according to the torque of the engine 1.

Please delete the full paragraph on page 17 and insert the following paragraph:

Next, a description will be given of a travel by the engine 1 at a time of low vehicle speed (in a first speed drive state). The start clutch 3 is set to "ON", the high speed multi-plate clutch 14 is set to "OFF", the gear change dog clutch 17 is set to the 1st position, and the motor generator dog clutch 9 is set to "OFF" (No. 7). At this time, it is possible to run at a low vehicle speed by the engine 1. Further, the start clutch 3 is set to "ON", the high speed multi-plate clutch 14 is set to "OFF", the gear change dog clutch is set to the 1st position, and the motor generator dog clutch 9 is set to "ON" (No. 8). At this time, in the case that a residual capacity of the battery 13 is [a little] low and a necessity of generating power by driving the motor generator 11 by means of the engine 1 is generated, running by the engine 1 and the power generation by the motor generator 11 can be performed. Further, in the case that the battery 13 is fully charged and has the residual capacity in reserve, a torque assist can be performed by the motor generator 11, and running can be performed by the engine 1 and the motor generator 11. Further, in the drive [motor] mode No. 8 mentioned above, since the motor generator 11 is directly connected to the transmission output shaft 19, energy can be regenerated when reducing the speed.

Please delete the paragraph starting on page 17 and ending on page 18 and insert the following paragraph:



Next, a description will be given of running [by] the engine 1 at the middle vehicle speed time (in the second speed drive state).

Please delete the full paragraph on page 18 and insert the following paragraph:

The start clutch 3 is set to "ON" the high speed multi-plate clutch 14 is set to "OFF", the gear change dog clutch 17 is set to the 2nd position, and the motor generator dog clutch 9 is set to "OFF" (No. 9). At this time, it is possible to run at middle vehicle speed by the engine 1. Further, the start clutch 3 is set to "ON", the high speed multi-plate clutch 14 is set to "OFF", the gear change dog clutch is set to the 2nd position, and the motor generator dog clutch 9 is set to "ON" (No. 10). In the same manner as that at the low vehicle speed time, in the case that a residual capacity of the battery 13 is [a little] low and a necessity of generating power by driving the motor generator 11 by means of the engine 1 is generated, running by the engine 1 and the power generation by the motor generator 11 can be performed. Further in the case that the battery 13 is fully charged and has the residual capacity in reserve a torque assist can be performed by the motor generator 11, and running can be performed by the engine 1 and the motor generator 11. Further, in the drive [motor] mode No. 10 mentioned above, since the motor generator 11 is directly connected to the transmission output shaft 19, [an] energy can be regenerated when reducing the speed.

Please delete the full paragraph on page 19 and insert the following paragraph:

The start clutch 3 is set to "ON", the high speed multi-plate clutch 14 is set to "OFF", the gear change dog clutch 17 is set to the N (neutral) position, and



the motor generator dog clutch 9 is set to "OFF" (No. 11). At this time, it is possible to run at high vehicle speed by the engine 1. Further, the start clutch 3 is set to "ON", the high speed multi-plate clutch 14 is set to "OFF", the gear change dog clutch is set to the N (neutral) position, and the motor generator dog clutch 9 is set to "ON" (No. 12). In the same manner as that at the low and middle vehicle speed times, in the case that a residual capacity of the battery 13 is [a little] low and a necessity of generating power by driving the motor generator 11 by means of the engine 1 is generated, running by the engine 1 and the power generation by the motor generator 11 can be performed. Further, in the case that the battery 13 is fully charged and has the residual capacity in reserve, a torque assist can be performed by the motor generator 11, and running can be performed by the engine 1 and the motor generator 11. Further, in the drive [motor] mode No. 10 mentioned above, since the motor generator 11 is directly connected to the transmission output shaft 19, [an] energy can be regenerated when reducing the speed.

Please delete the first full paragraph on page 20 and insert the following paragraph:

Further, in the structure according to the invention, it is possible to regenerate the energy at the speed reduction time in all the drive modes during running. For example, in the drive modes [No.] Nos. 7, 9 and 11 mentioned above, when synchronizing the transmission input shaft 4 and the motor generator output shaft 10 and setting the motor generator dog clutch 9 to "ON" at the speed reduction time, [the] energy can be regenerated.

Please delete the second full paragraph on page 20 and insert the following paragraph:



Further, since the motor generator 11 serves as a starter for starting the engine 1, a gear ratio between the middle speed drive gear 7 and the motor generator driven gear 8 is designed so as to transmit the torque from the transmission input shaft 4 to the motor generator 11 in an increasing manner. Accordingly, since it is possible to reduce the torque of the motor generator 11 required at a time of starting the engine 1 and the torque of the motor generator 11 is transmitted to the transmission input shaft 4 in a [reducing] reduced manner, it is possible to reduce the torque of the motor generator 11 required when running and assisting torque by the motor generator 11, so that it is possible to make the motor generator 11 compact and light.

Please delete the full paragraph on page 21 and insert the following paragraph:

Fig. 2 is a schematic view in the case of accelerating the vehicle [in a state of running] by the drive force of the engine. A dotted thick line "A" in Fig. 2 shows a transmission course of the torque. As an example, a case of engaging the start clutch 3 and engaging the gear change dog clutch 17 with the low speed driven gear 16 is supposed. At this time, the torque of the engine 1 is transmitted to the transmission output shaft 19 via the low speed drive gear 6 and the low speed driven gear 16. Here, in the case of accelerating the vehicle, since the motor generator 11 is intercepted from the transmission input shaft 4 by the motor generator dog clutch 9 and the inertia torque of the motor generator 11 can be reduced, it is not necessary to increase the torque of the engine 1 and the specific fuel consumption can be reduced at a time of acceleration.

Please delete the paragraph starting on page 21 and ending on page 23 and insert the following paragraph:



Figs. 3 and 4 are schematic views in the case of changing speed from the first speed drive state in Fig. 3 to the second speed drive state. When the vehicle speed [becomes in] shifts into the gear change state, the gear change dog clutch 17 is [made] in the disengaged state so as to disengage a connection between the low speed driven gear and the transmission output shaft 19 as shown in Fig. 4. At the same time, the torque of the engine 1 is transmitted to the transmission output shaft 19 via the high speed driven gear 15 by controlling the hydraulic actuator 24 so as to press the high speed multi-plate clutch 14. The torque of the engine 1 is transmitted to the wheel axle 23 due to the pressing force of the high speed multi-plate clutch 14 so as to become a drive torque for the vehicle, and the rotational speed of the engine 1 is reduced due to the increased load of the engine 1 because the gear change ratio is reduced by the high speed driven gear, so that the gear change ratio between the transmission output shaft 19 and the transmission input shaft 4 becomes close to the gear change ratio of the second speed from the gear change ratio of the first speed (in the direction of [becoming small] decreasing). At this time, the torque of the engine 1 is transmitted according to a transmission course from the engine output shaft 2 to the transmission output shaft 19 successively through the start clutch 3, the transmission input shaft 4, the high speed drive gear 5, the high speed multi-plate clutch 14 and the high speed driven gear 15. Here, when the gear change ratio between the transmission input shaft 4 and the transmission output shaft 19 becomes the gear change ratio of the second speed, the gear change dog clutch 17 engages with the middle speed driven gear 18 so as to engage the middle speed driven gear 18 with the transmission output shaft 19, as shown in Fig. 4. When the connection is completed, the hydraulic actuator 24 is controlled so as to release the pressing force of the high speed multi-plate clutch 14, whereby the gear change from the first speed to the second speed is completed. At this time,



the torque of the engine 1 is transmitted according to a transmission course from the engine output shaft 2 to the transmission output shaft 19 successively through the start clutch 3, the transmission input shaft 4, the middle speed drive gear 6 and the middle speed driven gear [15] 18.

Please delete the paragraph starting on page 23 and ending on page 24 and insert the following paragraph:

As mentioned above, the first speed drive state is disengaged at a time of gear change so as to become the neutral state, however, at this time, since the torque of the engine 1 is transmitted to the wheel axle 23 by the high speed multi-plate clutch 14, the high speed drive gear 5 and the high speed driven gear 15, it is not necessary that the driver [returns] return the acceleration pedal (that is, it is not necessary that the torque and the rotational speed of the engine 1 [are] be adjusted). According to this structure, it is possible to change speed of the gear transmission while accelerating the vehicle. On the contrary, in the case that the driver returns the acceleration pedal and controls the electronically controlled throttle 22 so as to narrow the throttle during the driving, a rotational synchronization between the transmission input shaft 4 and the transmission output shaft 19 by the high speed multi-plate clutch 14 becomes early (the rotational speed of the engine 1 is [early] reduced early), so that it is possible to shorten [a] the time for changing the speed.

Please delete the paragraph starting on page 24 and ending on page 25 and insert the following paragraph:

Fig. 5 is a schematic view of a whole of an automobile system according to a second embodiment of the invention. This system corresponds to a structure in which a motor generator dog clutch [9] 9b is arranged in a side of the



transmission input shaft 4 and a middle speed drive gear 7b is accordingly arranged so as to freely rotate with respect to the transmission input shaft 4, in the structure shown in Fig. 1. Further, a motor generator driven gear [8b] 8 is fixed to the motor generator output shaft 10. The other structures are the same as those shown in Fig. 1, the same reference numerals as those in Fig. 1 are provided to the same elements in Fig. 5, and a description thereof will be omitted. Further, when employing the structure, there is a disadvantage that the motor generator 11 is rotated in an accompanying manner when running according to the engine 1 in the drive mode No. 9 shown in Table 1, however, it is possible to disengage the motor generator 11 when running according to the engine 1 in the other drive modes, and since the inertia torque of the motor generator 11 can be reduced in the case of accelerating the vehicle, it is not necessary to increase the torque of the engine 1, whereby the specific fuel consumption can be reduced when accelerating.

Please delete the paragraph starting on page 27 and ending on page 28 and insert the following paragraph:

Fig. 7 is a schematic view of a transmission for a front engine front drive vehicle (an FF vehicle) to which the present invention is applied. A transmission input shaft 804 and a transmission output shaft 819 are arranged in an inner portion of a housing 850 so as to be in parallel to each other and freely rotate. The housing 850, 950 is constituted by a substantially cylindrical main body portion 862, a clutch housing 851, 951 and a differential gear housing 854, 954 which are integrally formed, a front portion 863, 963 mounted to a front end side of the main body portion 862 and an extension portion 864 mounted to a rear end side of the main body portion 862. A supporting portion 865 extending to a center side from an inner peripheral surface is formed in a rear end side of the



main body portion 862, a partition wall portion 853, 953 is formed in the front portion 863, the transmission input shaft 804 extends through the partition wall portion 853, and one end portion thereof extends to a bearing 852 mounted [t] to a rear end side of the extension portion 864, whereby the transmission input shaft 804 is rotatably supported via the partition wall portion 853 and the bearing 852. A start clutch 803 is mounted to an end portion protruding into the clutch housing 851 of the transmission input shaft 804, and the transmission input shaft 804 is connected to an engine output shaft 802 via the start clutch 803. On the contrary, the transmission output shaft 819 is rotatably supported to bearings 852, 1152 respectively mounted to the partition wall portion 853 and a supporting portion 865. Further, a motor generator output shaft 810 is arranged on the same axis as the transmission output shaft 819. The motor generator shaft 810 is rotatably held by the bearings 852 respectively arranged in the supporting portion 865 and an inner surface of the extension portion 864. A motor generator 811 is installed within the extension portion 864, and a motor generator output shaft 810 is integrally formed with a rotor 860 thereof.

Please delete the paragraph starting on page 28 and ending on page 29 and insert the following paragraph:

Further, a motor generator driven gear 808 is integrally mounted to the motor generator output shaft 810, and a motor generator drive gear 861, 1061 and 1161, always engaging with the motor generator driven gear 808, is rotatably arranged on the same axis as the transmission input shaft 804. Reference [numerals] numeral 809 [denote] denotes a motor generator dog clutch[,] and has a function of engaging or disengaging the motor generator drive gear 861 with respect to the transmission input shaft 804. The differential gear housing 854 is formed in an outer side in a radial direction of the clutch housing



851 mentioned above, a differential gear carrier 858, 958 holding a pinion 857, 957 and a pair of right and left side gears 866, 966 engaging with the pinion 857 [are] is provided in an inner portion thereof, and a ring gear 856, 956 is integrally mounted to the differential gear carrier 858. Then, a drive [gar] gear 855, 955 engaging with the ring gear 856 is integrally mounted to the transmission output shaft 819, and a portion 820 obtained by surrounding the pinion 857, the differential gear carrier 858, the side gear 866, the ring gear 856 and the drive gear 855 is [totally] in total called [as] a final gear. In this case, reference [numerals] numeral 823 [denote] denotes a front wheel drive shaft, and these elements are connected to the side gear 866.

Please delete the paragraph starting on page 29 and ending on page 30 and insert the following paragraph:

Fig. 8 is a schematic view of a [Transmission] transmission for the front engine front drive vehicle (the FF vehicle) to which the present invention is applied, in the same manner as Fig. 7, in which a method of arranging the motor generator and the high speed multi-plate clutch is changed. In Fig. 8, a transmission output shaft 919 extends to a rear end side of an extension portion 964 and is rotatably supported by bearings 952 respectively arranged in a main body portion 962 and an inner surface of the extension portion 964. Further, a rotor 960 of the motor generator 911 corresponds to an output shaft of the motor generator and the rotor 960 is integrally formed with a motor generator driven gear 908. The motor generator driven gear 908 and the rotor 960 integrally formed with each other are rotatably arranged on the same axis as the transmission input shaft 904, and the [structures] structure is made such that the motor generator 911 is directly connected to the transmission input shaft 904 by engaging a motor generator dog clutch 909 with a motor generator driven



gear 908. Further, a high speed driven gear 905 and a transmission output shaft 919 are connected by pressing a high speed multi-plate clutch 914. At this time, a torque from the [trans-mission] transmission input shaft 904 is transmitted according to a transmission course from the transmission input shaft 904 to the transmission output shaft 919 successively through the high speed drive gear 915, the high speed driven gear 905 and the high speed multi-plate clutch 914. Since the other structures are the same as those in Fig. 8, a description thereof will be omitted.

Please delete the paragraph starting on page 30 and ending on page 31 and insert the following paragraph:

Fig. 9 is a schematic view showing a control device of a hybrid vehicle employing the [Transmission] transmission shown in Fig. 7. Reference [numerals] numeral 2000 in Fig. 9 [denote] denotes a driver's intention detecting means. The driver's intention detecting means normally corresponds to an acceleration pedal, a brake pedal and a shift lever. Reference [numerals] numeral 1001 [denote] denotes an engine[, in]. In the engine 1001, an amount of intake air is controlled by an electronically controlled throttle 1022 provided in an intake pipe (not shown), and an amount of fuel corresponding to the amount of air is injected from a fuel injection apparatus (not shown). Further, an ignition timing is determined from signals such as an air-fuel ratio, an engine rotational speed or the like determined by the amount of air and the amount of fuel. Reference [numerals] numeral 2002 [denote] denotes an engine control device. The engine control device 2002 is an apparatus for controlling the engine by the electrically controlled throttle 1022, and for example, constituted by a micro computer, an electric circuit, a motor and the like. An acceleration pedal opening degree, a brake pedaling force, a position of the shift lever, a residual

capacity of the battery, a vehicle speed, an engine rotational speed, a motor rotational speed are input to a power train control device 2001 in Fig. 9. Further, the power train control device 2001 controls so that a torque of the engine 1001 is calculated, a throttle valve opening degree for achieving the engine torque is calculated so as to be transmitted to the engine control device 2002 by communicating means, and the electronically controlled throttle 1022 achieves a desired throttle valve opening degree.

Please delete the paragraph starting on page 31 and ending on page 32 and insert the following paragraph:

Further, in the power train control device 2001, a torque of the motor generator 1011 is calculated so as to be transmitted to a motor control device 2005 by communicating means, whereby each of actuators is controlled. The motor control device 2005 charges an electric power generated by the engine 1001 and a regeneration electric power obtained at a time of reducing the speed of the vehicle into the battery, or supplies the electric power from the battery for driving the motor generator 1011, in correspondence to the volume of the battery. Further, in Fig. 9, reference numerals 1003 denote a start clutch, 1014 a high speed multi-plate clutch, 2004 a multi-plate clutch control device, 1017 a gear change dog clutch and 1009 a motor generator dog clutch. In the power train control device 2001, a target start clutch position is calculated so as to be transmitted to a start clutch control device 2003 by communicating means, whereby the start clutch 1003 is controlled. In the same manner, the high speed multi-plate clutch 1014 is controlled by a multi-plate clutch control device 2005, and the gear change dog clutch 1017 and the motor generator dog clutch 1009 are controlled by a dog clutch control device 2006.



Please delete the full paragraph on page 32 and insert the following paragraph:

Fig. 10 is [an idiomatic] a schematic view of a hybrid vehicle in which the [Transmission] transmission shown in Fig. 7 is provided in a front wheel side. As shown in Fig. 10, it is possible to mount the [Transmission] transmission to the automobile without adding the motor generator to the drive wheel side (for example, in a rear wheel side).

Please delete the paragraph starting on page 32 and ending on page 33 and insert the following paragraph:

Fig. 11 is a schematic view of a system (a fourth embodiment of the present invention) in which a motor 300 is added between the engine 1 and the start clutch 3 in the [Transmission] transmission shown in Fig. 1 and the high speed multi-plate clutch is arranged in a side of the transmission input shaft. The motor 300 is used for starting the engine 1 and driven by the engine 1 so as to generate power. Further, when reducing speed, the start clutch 3 is set to "ON" so as to regenerate. Further, in [the] case that the residual capacity of the battery is sufficient, the motor 300 can be used for assisting torque, whereby a great drive force can be obtained. Further, the high speed drive gear 5 and the transmission input shaft 4 are connected by pressing the high speed multi-plate clutch 14. At this time, a torque from the transmission input shaft 4 is transmitted according to a transmission course from the transmission input shaft 4 to the transmission output shaft 19 successively through the high speed multi-plate clutch 14, the high speed drive gear 5 and the high speed driven gear 15. The other structures are the same as the structures shown in Fig. 1, the same reference numerals in Fig. 1 are attached to the same elements in Fig. 11, and a description thereof will be omitted.



Please delete the second full paragraph on page 34 and insert the following paragraph:

(1) [According to] By way of the clutch for adjusting the transmission torque between the input shaft and the output shaft in the gear change apparatus, it is possible to reduce the gear change shock generated during the gear change operation without adding the electric rotary machine to the drive wheel side from the gear change apparatus.

Please delete the paragraph starting on page 34 and ending on page 35 and insert the following paragraph:

(4) [According to] By way of the clutch for disengaging the output shaft of the electric rotary machine from the electric rotary machine side input shaft of the gear change apparatus, it is possible to disengage the engine from the electric rotary machine as occasion demands and prevent the inertia torque of the electric rotary machine from applying to the engine side as a load.

IN THE CLAIMS

Please amend the claims as follows:

1. (Amended) A power transmission apparatus of motor vehicles, comprising:

an engine;

a gear change apparatus provided between said engine and a vehicle drive shaft;

an electric rotary machine connected to an output shaft of said engine and said vehicle drive shaft via said gear change apparatus; and

a clutch provided [between] on an input shaft [and] or an output shaft of said gear change apparatus in order to change a torque transmission course, and [adjusting] by which a gear change operation is carried out to adjust a transmission torque between said input shaft and said output shaft.

2. (Amended) A power transmission apparatus of motor vehicles according to claim 1, wherein said clutch is mounted on a gear having a [minimum] lowest gear change ratio in said gear change apparatus.

3. (Amended) A power transmission apparatus of motor vehicles, comprising:

an engine;

a gear change apparatus provided between said engine and a vehicle drive shaft; and

an electric rotary machine connected to an output shaft of said engine and said vehicle drive shaft via said gear change apparatus,

wherein a rotation of an output shaft of said electric rotary machine is reduced and transmitted to an engine side input shaft of said gear change apparatus, and

wherein a first gear is mounted on the output shaft of the electric rotary machine and a second gear is mounted on the input shaft of the gear change apparatus, each of the output shaft of the electric rotary machine and the input shaft of the gear change apparatus being provided with a respective clutch.

4. (Amended) A power transmission apparatus of motor vehicles, comprising:

an engine;

a gear change apparatus arranged between said engine and a vehicle drive shaft; and

an electric rotary machine connected to an output shaft of said engine and said vehicle drive shaft via said gear change apparatus,

wherein the output shafts of said engine and said electric rotary machine are provided separately, and

wherein gears respectively mounted on [said two shafts] an input shaft of the gear change apparatus for transmitting the power of the output shaft of said engine and the output shaft of said electric rotary machine directly engage with each other, the input shaft of the gear change apparatus and the output shaft of the electric rotary machine having respective clutches.